ROTARY BRUSH WITH SOAP DISPENSER

Field of the Invention

The present invention relates generally to the field of cleaning devices. More specifically, the present invention relates to rotary brushes having simplified soap-dispensing features for cleaning motor vehicles or the like.

Background of the Invention

Rotary brushes are used in certain industries to clean trucks, automobiles, bulldozers, or other motor vehicles of soil or other contaminants. In the construction field, for example, rotary brushes are often utilized to clean vehicles at various transfer locations as they enter or exit a construction site. Such cleaning devices typically include a brush head with an attached brush, pad, sponge or other cleaning implement that can be rotated on the surface to be cleaned. The brush head may be either fluid driven, using a pressurized source of fluid and an impeller blade, or motor driven, using an attached motor. In some devices, the brush head may be coupled to an elongated shaft having an internal fluid line that supplies pressurized fluid to the brush head. A cleaning agent such as liquid detergent or polish may be applied to the cleaning surface while the brush head is rotated to further clean the surface, as necessary.

Summary of the Invention

The present invention relates to rotary brushes having a simplified soap-dispensing feature for cleaning surfaces on motor vehicles or other structures. A rotary brush in accordance with an exemplary embodiment of the present invention includes a brush head assembly operatively coupled to a telescopic handle that can be controlled by the

user to deliver a cleaning agent to the brush head assembly. The telescopic handle may include a fluid conduit configured to deliver fluid to an orifice in the brush head assembly. In certain embodiments, a coupling member attached to the fluid conduit at one end of the telescopic handle may be fluidly coupled to an external fluid source. An internal chamber disposed within the telescopic handle may be filled with a cleaning agent that can be delivered through a lumen in the telescopic handle. In use, a pumping force can be periodically applied to the telescopic handle to compress the cleaning agent within the internal chamber, forcing the material into the brush head assembly.

The brush head assembly may include a rotary brush head driven by a motor and gearing mechanism. In certain embodiments, the rotary brush may include an outer, stationary brush concentrically disposed about an inner, rotary brush head. The motor used to drive the rotary brush may be either electrically or pneumatically powered, and may include a telescoping drive shaft that permits the motor to be mounted away from the brush head assembly. In some embodiments, the motor may include a DC powered motor having a battery that can be recharged when the brush is not in use.

Brief Description of the Drawings

Figure 1 is a perspective view of a rotary brush in accordance with an exemplary embodiment of the present invention;

Figure 2 is a side view of the rotary brush of Figure 1, showing, in section, the brush head assembly and a portion of the telescopic handle;

Figure 3 is a bottom view of the rotary brush of Figure 1, showing an exemplary arrangement of the rotary and stationary brush heads;

Figure 4 is a cross-sectional view of the coupling member illustrated in Figure 1;

Figure 5 is a side, partial cross-sectional view of the rotary brush of Figure 1, showing the telescopic handle in a fully expanded position;

Figure 6 is another side, partial cross-sectional view showing the telescoping shaft of the rotary brush in a retracted position;

Figure 7 is a perspective view of a rotary brush in accordance with another exemplary embodiment of the present invention, wherein the rotary brush includes a telescopic motor assembly;

Figure 8 is a perspective view of a rotary brush in accordance with another exemplary embodiment of the present invention;

Figure 9 is a side, partial cross-sectional view showing the telescoping shaft of the rotary brush of Figure 8 in a fully expanded position; and

Figure 10 is another side, partial cross-sectional view showing the telescoping shaft of the rotary brush of Figure 8 in a retracted position.

Detailed Description of the Invention

The following description should be read with reference to the drawings, in which like elements in different drawings are numbered in like fashion. The drawings, which are not necessarily to scale, depict selected embodiments and are not intended to limit the scope of the invention. Although examples of construction, dimensions, and materials are illustrated for the various elements, those skilled in the art will recognize that many of the examples provided have suitable alternatives that may be utilized.

Figure 1 is a perspective view of a rotary brush 10 in accordance with an exemplary embodiment of the present invention. Rotary brush 10 includes a brush head assembly 12, a telescopic handle 14, and a motor 16 configured to drive a rotary brush on

the brush head assembly 12. In the illustrative embodiment of Figure 1, rotary brush 10 is especially suited for use in cleaning motor vehicles, having a telescopic handle 14 that extends a length of about 5-8 feet to facilitate cleaning of windows, beds, roofs, hoods or other hard to reach surface areas. Rotary brush 10 may, however, be used in other cleaning applications, as desired.

The telescopic handle 14 may be fluidly coupled to a hose 20 or other fluid source to provide pressurized fluid to the brush head assembly 12. The hose 20 may be configured to deliver fluid at street water pressure (*i.e.* about 30-40 psi), or can be connected to a pump or pressure tank and configured to deliver pressurized fluid at higher pressures, generally in the range of 100-2,000 psi.

The telescopic handle 14 may include a first elongated member 22 in telescopic relationship with a second elongated member 24. The first elongated member 22 may be formed from a tubular member having a circular, rectangular or other cross-sectional shape with one end 26 secured to the brush head assembly 12, and an opposite end 28 slidably disposed within the second elongated member 24. The second elongated member 24 may include one end 30 configured to slidably receive end 28 of the first elongated member 22, and an opposite end 32 threadably connected to a coupling member 34 that secures the hose 20 to the rotary brush 10. The second elongated member 24 may be configured similar to the first elongated member 22, but is of generally greater size to permit the first elongated member 22 to retract telescopically into the second elongated member 24, as discussed below.

In a fully expanded position illustrated in Figure 1, the first and second elongated members 22,24 form an elongated handle that can be controlled by the user to clean

various surfaces in a variety of positions. An elastomeric sleeve 36 of rubber, foam plastic or other suitable material disposed about the second elongated member 24 forms a grip that can be used to manipulate the rotary brush 10. In certain embodiments, the elongated members 22,24 may be formed from a lightweight metal or metal alloy (*e.g.* aluminum) to reduce the total weight of the device. Polymeric materials such as polycarbonates or thermoplastics having certain desirable characteristics such as high strength and corrosion-resistance may also be used to form the elongated members 22,24.

Figure 2 is a side view of the rotary brush of Figure 1, showing, in section, the various components of the brush head assembly 12 and telescopic handle 14. As shown in Figure 2, brush head assembly 12 includes a housing 38 that supports a stationary brush head 40 and rotary brush head 42, and which contains a sealed gearing mechanism 44 operatively coupled to the motor 16. The housing 38 includes an internal wall 46 that seals and divides an upper portion 48 containing the gearing mechanism 44 from a lower portion 50 having a structure that supports the brush heads 40,42 in concentric alignment. The upper portion 48 of housing 38 may be hermetically sealed to prevent water, dirt, soap or other contaminants from interfering with the operation of the gearing mechanism 44.

Gearing mechanism 44 comprises a gear 52 and pinion 54 operatively coupled to a motor drive shaft 56 attached to and extending from the motor 16. The pinion 54 may be secured to the motor drive shaft 56, and may include a set of teeth that engage a corresponding set of teeth on the gear 52. In the exemplary embodiment illustrated in Figure 2, pinion 54 is configured to drive a spiraled bevel gear, which is particularly useful for higher motor speeds. Other types of gears such as straight, mitered, hypoid,

spiroid or worm may be employed, however, depending on the relative orientation of the motor drive shaft 56 to the gear 52 as well as other design factors. In certain embodiments, the gear 52 and/or pinion 54 may have a geometry factor configured to reduce rotational speed and increase torque output from the motor 16.

Gearing mechanism 44 may also be operatively coupled to a shaft 58 secured at one end 60 to the gear 52, and at an opposite end 62 to the rotary brush head 42. A bearing 64 secured within a flanged opening 66 on the internal wall 46 of the housing 38 encases the shaft 56, allowing it to freely translate rotary motion from the gear 52 to the rotary brush head 42. The bearing 64 may be sealed to prevent water, soap or other contaminants from entering the upper portion 48 of the housing 38.

The motor 16 used to drive the gearing mechanism 44 may be electrically powered with a DC or AC power source, or may be pneumatically powered with an external source of pressurized air. A switch 68 mounted on the motor 16 may be toggled between an on and off position to energize the motor 16 and rotate the brush head 42, as desired. In certain embodiments, the motor 16 may include a rechargeable battery permitting the device to be recharged periodically after extended use with the use of an optionally supplied electrical cord. The ability to operate the motor 16 with power supplied internally from a rechargeable battery or other DC power source may be a particularly useful feature in those applications where AC power or air is not readily available, or where environmental factors prohibit such use.

As further shown in Figure 2, the first and second elongated members 22,24 may each be configured to deliver pressurized fluid and a cleaning agent to the brush head assembly 12. The first elongated member 22 may include a passageway 70 that contains

a flexible hose 72 extending from the coupling member 34, through an internal chamber 74 within the second elongated member 24, and into the brush head assembly 12. The flexible hose 72 may be fluidly coupled to the hose 20 via the coupling member 34, and may be configured to bend or flex within the internal chamber 74 when the first elongated member 22 is retracted into the second elongated member 24. In use, pressurized fluid from the hose 20 can be delivered through the flexible hose 72 to supply fluid to the brush heads 40,42.

In another aspect of the present invention, rotary brush 10 may be configured to releasably store a cleaning agent such as a liquid detergent or polish that can be periodically injected into the brush heads 40,42 by a pumping force resulting from the retraction of the first elongated member 22 into the second elongated member 24. Internal chamber 74 may configured to receive a cleaning agent that, when compressed, is forced through a detergent lumen 76 disposed within the first elongated member 22. A set of O-rings 78 provides a seal that prevents cleaning agent from escaping from within the internal chamber 74.

Figure 3 is a bottom view of the rotary brush 10, showing the rotary and stationary brush heads 40,42 in greater detail. As shown in Figure 3, the stationary brush head 40 is arranged concentrically about the rotary brush head 42, and includes a number of bristles 80 that can be placed into contact with the cleaning surface. The bristles 80 may be secured to a flat, horizontal surface 82 on the brush head assembly 12, which remains stationary during use. The rotary brush head 42 may be configured to rotate relative and adjacent to the stationary brush head 40, and similarly includes a number of bristles 84 that can be placed into contact with the cleaning surface.

The bristles 80,84 may be of approximately the same length for washing relatively flat surfaces such as windshields, truck beds, or the like. Alternatively, the bristles 80,84 may have differing lengths and/or stiffnesses for other applications such as tire cleaning or engine degreasing, where more abrasion may be required. Other cleaning implements such as sponge disks or scouring pads may also be employed in lieu of, or in addition to, the bristles. For example, rotary brush 10 may be equipped with buffing pads that, upon contact with a liquid wax dispensed from within the internal chamber 74, can be used to apply a wax to the cleaning surface.

As can be further seen in Figure 3, the flexible hose 72 disposed within passageway 70 terminates at a first port 86 within the lower portion 50 of housing 38 to supply fluid to the brush heads 40,42. The first port 86 may be bent at a slight angle to direct the fluid towards the center 88 of the brush head assembly 12 so that fluid is placed into contact with both sets of bristles 80,84. In similar fashion, the detergent lumen 76 may terminate at a second port 90 within the lower portion 50 of housing 38 to periodically supply a cleaning agent to both sets of bristles 80,84. In certain embodiments, the first and second ports 86,90 may taper or narrow slightly, adding impetus to the fluid/detergent streams as they exit the flexible hose 72 and detergent lumen 76.

Filling the rotary brush 10 may be accomplished by temporarily removing the coupling member 34, and then adding a cleaning agent such as liquid detergent or polish to the internal chamber 74. As shown in Figure 4, the coupling member 34 may have a set internal threads 92 at one end 94 configured to threadably engage a set of external threads 96 on end 32 of the second elongated member 24. A second set of internal

threads 98 at the opposite end 100 of the coupling 34 may be configured to threadably engage a set of external threads on the hose 20. A tapered, conically-shaped washer 102 secured to the end of the flexible hose 72 includes an opening 104 configured to channel fluid from hose 20 into the flexible hose 72, preventing fluid from entering the internal chamber 74 and mixing with the cleaning agent.

Turning now to Figures 5-6, an illustrative method of using a rotary brush in accordance with the present invention will now be described with respect to rotary brush 10 described above. In a first position illustrated in Figure 6, the telescopic handle 14 is shown in a fully extended position such that the first elongated member 22 is withdrawn almost entirely from within the second elongated member 24. A small detent 106 disposed about the outer periphery of the first elongated member 22 at or near end 28 may be used to releasably lock the first and second elongated members 22,24 together during use.

To periodically deliver cleaning agent to the brush heads 40,42, a pumping force may be applied by retracting the first elongated member 22 into the second elongated member 24, resulting in an increase in pressure within the internal chamber 74. As shown in Figure 6, retraction of the first elongated member 22 into the second elongated member 24 causes the cleaning agent to compress within the internal chamber 74, forcing the cleaning agent through the detergent lumen 76 and into contact with the brush heads 40,42. Continued pumping action of the first elongated member 22 within the second elongated member 24 delivers additional cleaning agent to the brush heads 40,42, as desired, until the internal chamber 74 is completely exhausted of cleaning agent.

Figure 7 is a perspective view of a rotary brush 108 in accordance with another exemplary embodiment of the present invention having a telescopic motor assembly 110. Rotary brush 108 may be configured similar to rotary brush 10, having a brush head assembly 112 operatively coupled to a telescopic handle 114 that can be fluidly coupled to a hose 116 or other source of pressurized fluid. The telescopic handle 114 may include a first elongated member 118 slidably disposed within a second elongated member 120, which can be pumped to dispense a cleaning agent contained therein.

In the illustrative embodiment of Figure 7, telescopic motor assembly 110 includes a motor 122 operatively coupled to a telescopic drive shaft 124 that drives a gear mechanism disposed within the brush head assembly 112. The motor 122 may be secured to the second elongated member 120 via several mounting brackets 126, and may include a switch 128 that can be activated to energize the motor 122. Since the motor 122 is mounted away from the brush head assembly 112, contaminants such as water, soap, soil, or grease typically located in the vicinity of the brush heads 40,42 do not contact the motor 122.

The telescopic drive shaft 124 may include a first drive member 130 in telescopic relationship with a second drive member 132. The first drive member 130 may be fixedly secured to the first elongated member 118 via a mounting bracket 134, and may include a keyway or other internal mechanism that transmits rotary motion from the second drive member 132 to the first drive member 130 while permitting relative axial movement therebetween. During operation, the telescopic motor assembly 110 can be configured to drive a rotary brush head in a manner similar to that described above with respect to rotary brush 10.

Figure 8 is a perspective view of a rotary brush 136 in accordance with another exemplary embodiment of the present invention. Rotary brush 136 may be configured similar to rotary brush 10 or 108 described above, having a brush head assembly 138, a telescoping handle 140, and a motor 142 configured to drive a rotary brush on the brush head assembly 138.

The telescoping handle 140 may include a first elongated member 144 in telescoping relationship with a second elongated member 146. The first elongated member may have one end 148 secured to the brush head assembly 138, and an opposite end 150 slidably disposed within the second elongated member 146. The second elongated member 146, in turn, includes one end 152 configured to slidably receive end 150 of the first elongated member 144, and an opposite end 154 connected to a removable end cap 156. An elastomeric sleeve 158 of rubber, foam plastic or other suitable member disposed about the second elongated member 140 forms a grip that can be used to manipulate the rotary brush 136 by the operator.

In the illustrative embodiment depicted in Figure 8, rotary brush 136 is configured to store and deliver a cleaning agent such as window cleaner or liquid soap within the telescopic handle 140 without the use of a hose or other external source of fluid. In a fully expanded position depicted in Figure 9, the second elongated member 140 defines an internal chamber 160 configured to receive the cleaning agent. The end 154 of the second elongated member 146 may be configured to threadably receive the removable end cap 156, allowing the user to fill and then seal the internal chamber 160 with the cleaning agent.

Operation of rotary brush 136 is similar to that described above with respect to rotary brush 10 or 108. To periodically delivery cleaning agent to the brush head assembly 138, a pumping force may be applied by retracting the first elongated member 144 into the second elongated member 146, resulting in an increase in pressure within the internal chamber 160. As shown in Figure 10, retraction of the first elongated member 144 into the second elongated member 146 causes the cleaning agent to compress within the internal chamber 160, forcing the cleaning agent through a lumen 162 disposed within the first elongated member 144 and into the brush head assembly 138. Continued pumping action of the first elongated member 144 within the second elongated member 146 delivers additional cleaning agent to the brush head assembly 138, as desired, until the internal chamber 160 is completely exhausted of cleaning agent.

Having thus described the several embodiments of the present invention, those of skill in the art will readily appreciate that other embodiments may be made and used which fall within the scope of the claims attached hereto. Numerous advantages of the invention covered by this document have been set forth in the foregoing description. It will be understood that this disclosure is, in many respects, only illustrative. Changes may be made in details, particularly in matters of shape, size and arrangement of parts without exceeding the scope of the invention.